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GB 1561207 A US 5358352 A US 5169257 A
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(71) Applicant(s)
Cassidy Brothers plc

(Incorporated in the United Kingdom)

Mitcham Road, BLACKPOOL, Lancashire, FY4 4QW, United Kingdom

(72) Inventor(s)
Stephen Michael Cassidy

(74) Agent and/or Address for Service
Mewburn Ellis
York House, 23 Kingsway, LONDON, WC2B 6HP, United Kingdom

(54) Adjustable seat

(57) An adjustable seat comprising first and second supporting parts 10, 12 interconnected by a pair of hinge assemblies 14, such that the supporting parts can be pivoted with respect to one another to allow a backrest of the seat to recline. The hinge elements are configurable by an operating plunger between an unlocked condition in which the backrest can be hingedly moved in relation to one another and a locked condition in which the backrest is fixed. Placement of the hinge element 14 in its unlocked condition is inhibited unless the seat parts are manually moved to a position away from that which they will move to under the influence of gravity alone. The result is that the hinges cannot be released without first supporting the seat backrest, thereby reducing the likelihood of the backrest dropping rapidly under the influence of gravity.

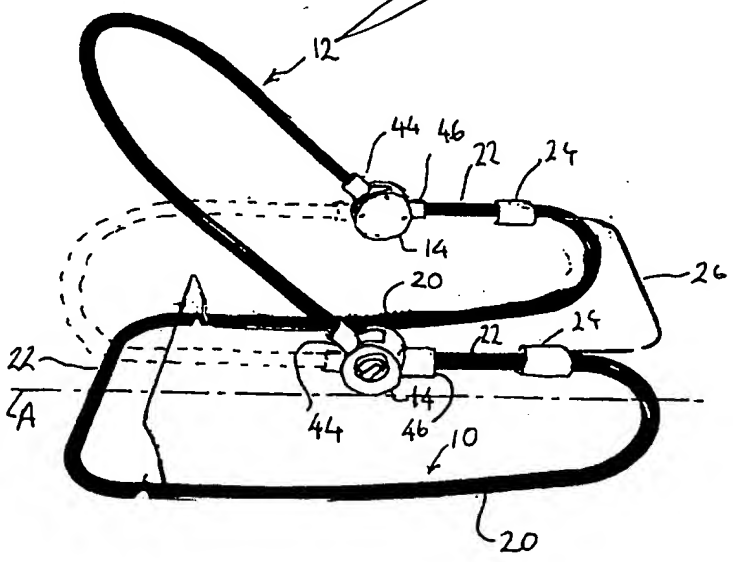

FIG. 1

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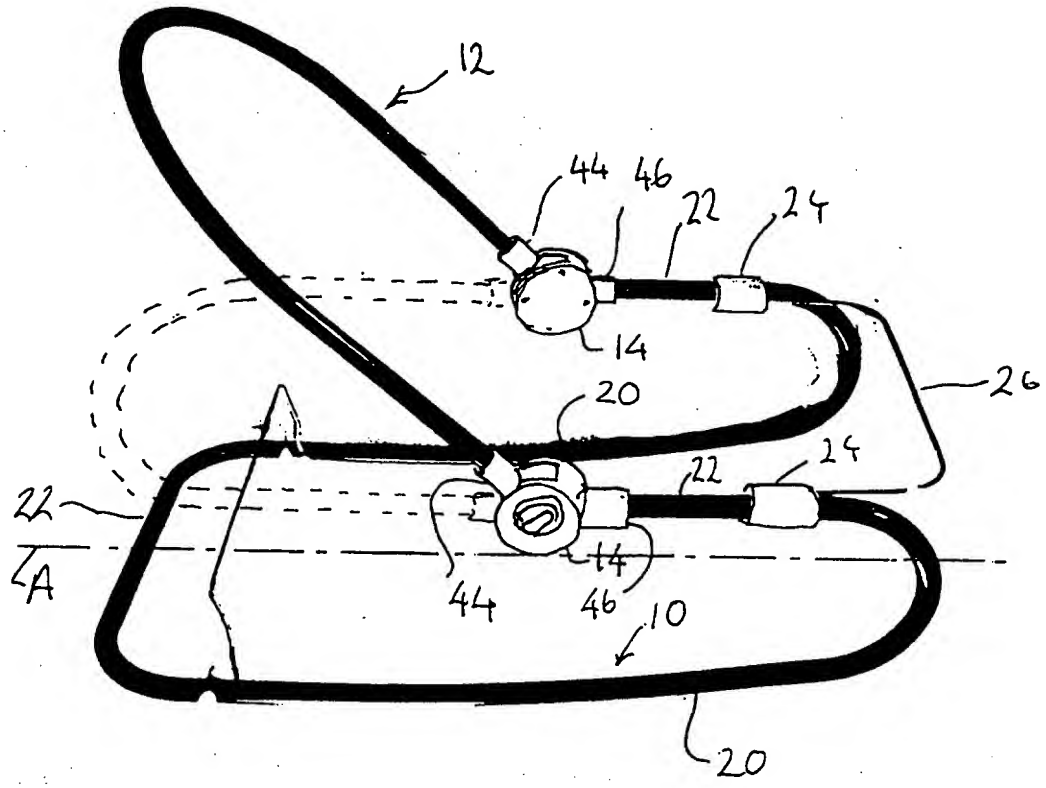

FIG. 1

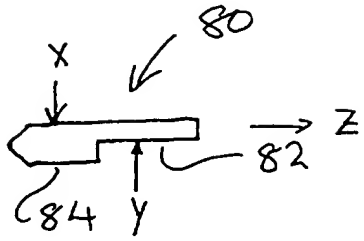

FIG. 4

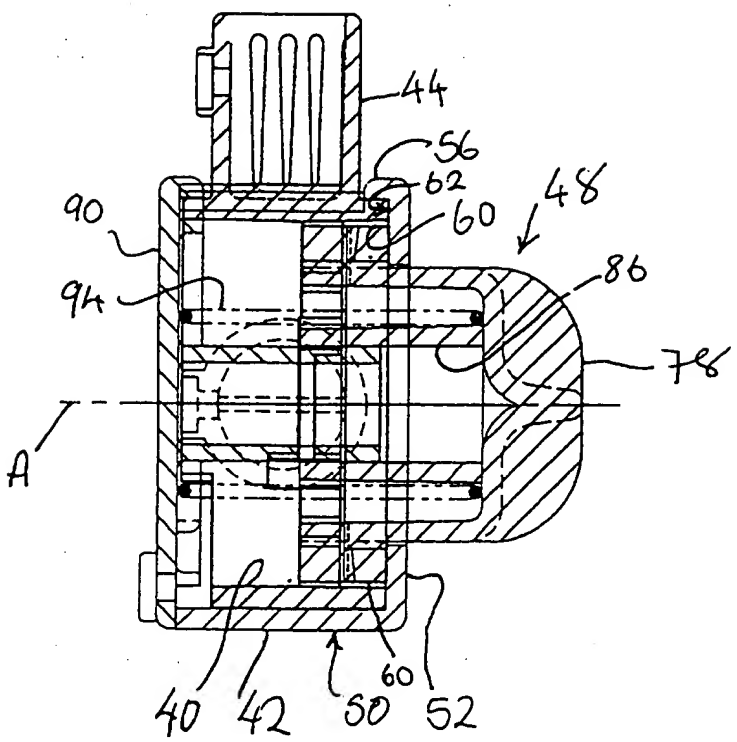
44
56
62
48
90
60
94
86
78
A
40
42
50
60
52

FIG. 2

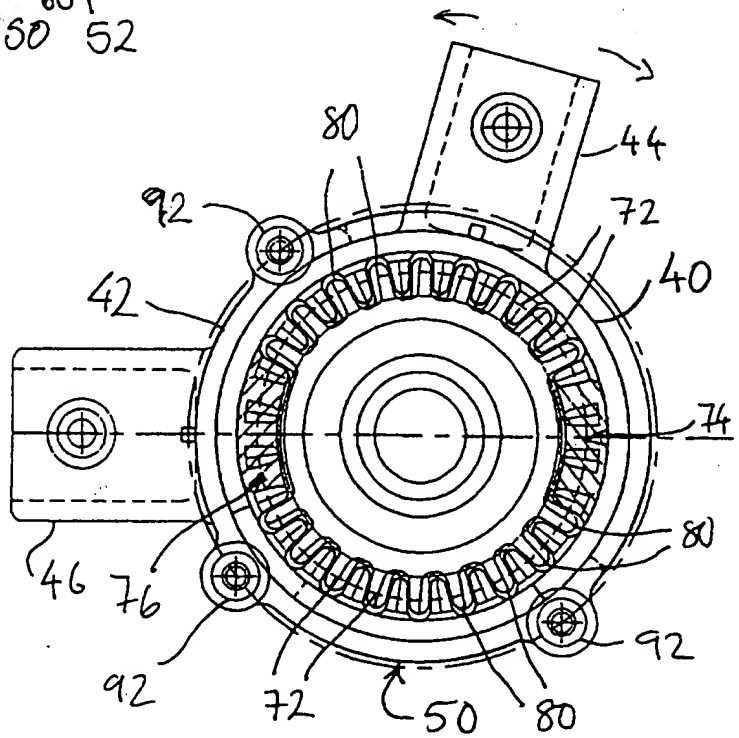
80
44
92
72
42
40
74
80
46
76
92
92
72
50
80

FIG. 3

ADJUSTABLE SEAT

The present invention relates to an adjustable seat which is typically used as a seat for a child, and also to a hinge element suitable for use in such a seat and in other applications.

A popular form of seat for a child comprises a frame of two bent metal tubes. A lower tube has a loop part which provides a supporting foot for the seat, and from which two end portions of the tube project diagonally upwardly over the loop part. An upper tube, formed into an approximate U-shape, is connected to the lower tube. A fabric seat cover is slung from the frame to provide a support in which a child can sit.

In seats of this form, the upper and lower tubes are, in some cases, interconnected by a hinge arrangement. By means of this hinge arrangement, the upper and lower tubes can be locked into a selected one of many relative positions such that the child can sit in a reclined or an upright position. In a particular arrangement, a pair of locking hinges are, disposed one on each side of the seat. These can be unlocked, to allow the upper tube to be freely moved, before the hinges are finally re-locked.

A disadvantage of this arrangement is that a person may try to adjust the seat by unlocking the two hinges simultaneously using their two hands (a not-unnatural

action). If this is done while a child is in the seat, the upper part will immediately drop unchecked to the reclined position. This can result in the child hitting the floor violently, with a real possibility of injury occurring.

It is an aim of the invention to provide a seat for a child in which a supporting part of the seat can be moved between an upright and a reclined position without the possibility of the seat dropping in an uncontrolled manner.

According to a first aspect of the invention there is provided a reclinable seat which comprises first and second supporting parts interconnected by a hinge element, which hinge element being configurable between an unlocked condition in which the seat parts can be hingedly moved in relation to one another and a locked condition in which the seat parts are relatively fixed, in which placement of the hinge element in its unlocked condition is inhibited unless the seat parts are manually moved to a position away from that which they will move to under the influence of gravity alone.

This arrangement ensures that an operator of the seat must take some positive act upon to ensure that it is supported against the action of gravity before the hinge lock can be released. Thus, there is far less likelihood of the seat back being allowed to drop freely.

The present invention is applicable not just to seats incorporating a tubular metal frame. It has potential application to substantially any seat which is reclinable or adjustable.

Each hinge element may be securable in its unlocked condition. This greatly facilitates adjustment of the seat. However, this does not compromise safety, since the seat must still be supported before the hinge is unlocked.

Suitably, each hinge element may be provided with a plunger which must be displaced bodily into the hinge against a spring force in order to place the hinge element in its unlocked condition. Preferably, in such embodiments, the direction of bodily displacement required to unlock the hinge is inwardly towards a centre-line of the seat.

In a preferred embodiment, each hinge element comprises inner and outer, mutually-rotatable bodies, each having a set of projecting teeth, and a plunger itself having a set of teeth, the teeth of the plunger being engagable simultaneously with the teeth of the bodies such engagement inhibiting relative movement of the bodies. The teeth of at least one of the bodies or the plunger may be shaped to interact with the teeth of at least one other of the bodies or the plunger so as to resist disengagement of the teeth while the relative positions of the teeth are those adopted while the sea is

unsupported by a user.

In a second of its aspects, the invention provides a hinge assembly comprising inner and outer, mutually-rotatable bodies, each having a set of projecting teeth, and a plunger itself having a set of teeth, the teeth of the plunger being simultaneously engagable with the teeth of the bodies such engagement inhibiting relative movement of the bodies, the teeth of at least one of the bodies or the plunger being shaped to interact with the teeth of at least one other of the bodies or the plunger so as to resist disengagement of the teeth while the relative positions of the bodies are at a limit of movement in a first direction and so as to permit disengagement of the teeth while the relative positions of the bodies are at a limit of movement in an opposite direction.

An embodiment of the invention will now be described in detail, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a general view of a frame for a seat for a child embodying the invention;

Figures 2 and 3 are orthogonal sectional view of a hinge assembly of the frame of Figure 1; and

Figure 4 is an end-on view of a tooth being part of a plunger of the hinge of figures 2 and 3.

With reference to Figure 1, a frame for a child's

seat comprises a lower part 10 and an upper part 12, each formed from a respective single bent steel tube. The lower seat part 10 and upper seat part 12 are interconnected by a pair of hinge assemblies 14. The frame is symmetrical about a front-to-rear axis A.

With the frame disposed for use, the lower frame part 10 has a ground-engaging portion formed as a U-shape when viewed in plan, having a two, generally parallel extents 20 interconnected by a transverse extent 22. The transverse extent is disposed to the rear of the frame.

Forwardly of the parallel extents 20, the tube curves upwardly and rearwardly in a general U-shape when viewed side-on, such that end portions 22 of the tube extend approximately horizontally, spaced above the ground. A mounting 24 is carried on each of the end portions 22, there being a stiff support wire of an approximate C-shape plan extending between the mountings 24, and projecting forwardly from them.

The upper frame part 12 is formed from a tube of a simple U-shape. End portions of the tube are parallel and spaced apart by a distance equal to the spacing between the end portions of the lower frame part 10.

To construct a seat, a fabric seat cover (not shown, in the interest of clarity) is slung on the frame. The seat cover is formed so as to enclose the upper frame part 12 is a bag-like portion, and to extend forwardly,

to receive the supporting wire 26 in a pocket formation.

As shown in Figure 1, the frame is such that the seat is in an upright position. The hinge assemblies 14 can be operated to permit movement of the upper frame part 12 to a position as shown in dotted lines. The seat then adopts a reclined position.

With reference to Figures 2 and 3, The construction and operation of the hinge assemblies 14 will now be described in detail.

Each hinge assembly comprises three main components: an inner body 40, an outer body 42 and a plunger 48. Each of the inner and outer bodies 40,42 has a respective connecting member 44,46 by means of which the bodies 40,42 can be connected to an end portion of the upper and lower frame parts 12,10 respectively. In this embodiment, the connecting members 44,46 are each short tubular projections into which an end portion of a tube of one of the frame parts 10,12 is received.

The outer body 40 comprises a side wall 50 which extends for approximately 200° about an axis A as a partial cylinder. At one axial end of the side wall, an annular end wall 52 is disposed extending inwardly from the side wall 50. The annular end wall 52 extends for 360° around the axis A. In the region from which the side wall 50 is absent, the end wall has a short axial turned-up lip 56.

A multiplicity of axially projecting axial teeth 60 are disposed on the end wall 52 in a circular locus, centred upon the axis A. The axial teeth 60 project a distance approximately 10% of the height of the side wall 52. The free axial end surfaces of the axial teeth 60 are chamfered so as to be angled to a point when viewed in cross-section. Side faces of the axial teeth 60 are aligned approximately radially of the axis A, such that they taper inwardly towards the axis A. The axial teeth 60 are spaced from the side wall 52 and from the periphery of the end wall 54 so as to leave a clear flat annular region 62 of the end wall 54.

The inner body 40 has a cylindrical wall 70 from which the connecting member 44 projects radially. The outer diameter of the cylindrical wall 70 is such as to be a close sliding fit within the side wall 52 of the outer body 42. The inner diameter of the cylindrical wall is great enough to encircle the axial teeth 60, such that a first end surface of the cylindrical wall 70 slides on the clear flat annular region 62 of the end wall 54.

Within the inner body 40, a multiplicity of radial teeth 72 project from the cylindrical wall radially inwardly. The radial teeth 72 are at the same pitch as the axial teeth 60 on the end wall, and project radially inwardly to a circular locus of substantially the same diameter as the circle defined by the radially inward extent of the axial teeth 60. The radial teeth 70 are

spaced from the first end surface by a distance just greater than the height of the axial teeth 60.

Two special radial teeth 74, 76 are provided. Each of these is effectively a region which would be occupied by a plurality (in this case two) of normal adjacent radial teeth. The gap which would normally exist between adjacent radial teeth is omitted to provide a radial projection of continuous extent. At one end region of one or both of the special radial teeth 74,76, there may be provided an axial projection. The purpose of the special radial teeth 74,76 will be described below.

The inner body 40 is disposed coaxially within the outer body 42 such that it can rotate relative to it, with the sets of axial and radial teeth 60,70 adjacent one another. The rotational movement is constrained by the connecting member 44 being unable to move within the region in which the side wall 50 is present.

The plunger 48 comprises a generally cylindrical body, a first end of which is closed and carries an axial projection 78 which extends diametrically across it. At an opposite second end region, a plurality of teeth 80 extend radially from the body. The teeth 80 are set at a pitch equal to that of the teeth 60,70 of the outer and inner bodies 42,40.

The teeth 80 do not extend continuously around the plunger 48. A plurality of teeth are omitted at

locations corresponding to the special radial teeth 74,76. The number of teeth omitted at each such location is one greater than the equivalent number of teeth conjoined to make one special tooth. Thus, in this embodiment, two groups of three teeth 80 are omitted. The teeth 80 on the plunger have an axial extent approximately equal to the combined extent of the sets of teeth 60,70 on the outer and inner bodies 42,40.

When viewed end-on, each of the teeth 80 of the plunger 48 has a stepped profile, as shown in Figure 4. The teeth 80 are disposed with a broader part 84 generally towards the projection 78 and a narrower part 82 generally remote from the projection. The broader part of the tooth is of such a width as to be a close fit between adjacent teeth 60,70 on the outer and inner bodies 42,40.

Within the plunger 48, a tubular part 86 extends axially to define a cylindrical void between itself and an outer wall of the body of the plunger 48.

In the hinge assembly, the plunger is disposed such that its body projects through the end wall 54 of the inner body 40. In such a disposition, the plunger can slide axially such that its teeth 80 can be brought selectively into or out of mesh with the teeth 60,70 on the outer and inner bodies 42,40.

The inner body 40 is retained within the outer body

42 by a cover plate 90 which is attached by screw fixings 92 to an end surface of the outer body 42 opposite the end wall 52. A helical spring 94 is maintained in compression between the cover plate 90 and the plunger 48, the spring 94 surrounding and being maintained in place by the tubular part 86 of the plunger 48

In the condition shown in Figure 2, the teeth on the plunger 80 are in mesh with the teeth 60,70 on the outer and inner bodies 42,40. This locks the hinge assembly. Movement between the inner and outer bodies 40,42 is limited by the clearance which exists between the various sets of meshing teeth 60,70,80.

When the seat is in use by a child, the position that the hinge assembly 14 will adopt is that gravity acting on the seat back will urge the inner body 40 to rotate in a clockwise direction when viewed in accordance with Figure 3. An axial tooth 60 of the outer body 42 will apply a force to a tooth 80 of the plunger 48 in the region of arrow X in Figure 4, and a radial tooth 70 of the inner body 42 will apply a force to a tooth 80 of the plunger 48 in the region of arrow Y in Figure 4. If a force is applied to the plunder 48 in a direction Z, axial movement of the plunger 48 will be resisted by the steps in the plunger teeth 80 coming into contact with the radial teeth 70 of the inner body 40. Thus, while the hinge assembly 14 is acted on by gravity alone, an attempt to unlock it will be resisted.

If the seat back is then lifted, the inner body 40 will move anticlockwise. The radial teeth 70 of the inner body 40 will move away from the steps in the teeth 80 of the plunger 48. This allows the plunger 48 to be urged against the force of the spring 94, such that its teeth 80 move out of mesh with the teeth 60,70 of the body parts 40,42. The body parts 40,42 can then move rotationally relative to one another. In this condition, the plunger 48 may be rotated by a user with the aid of the projection 78. Such movement results in the zone of the plunger 48 from which teeth 80 are absent moving out of alignment with the special teeth 74,76 of the inner body 40. At least one tooth 80 of the plunger will then come into contact with the special teeth 74,76 in the event that the plunger is released. This prevents axial movement of the plunger 48 under the force of the spring 94, with the result that the hinge assembly 14 will not immediately re-lock. This allows the second of the hinge assemblies 14 to be unlocked to permit adjustment of the seat.

Once the seat is adjusted as desired, the plunger 48 is rotated back to its normal position. Under the action of the spring 94, its teeth 80 are then urged back into mesh with the teeth 70 of the inner body.

CLAIMS

1. A reclinable seat comprising first and second supporting parts interconnected by a hinge element, which hinge element is configurable between an unlocked condition in which the seat parts can be hingedly moved in relation to one another and a locked condition in which the seat parts are relatively fixed, in which seat placement of the hinge element in its unlocked condition is inhibited unless the seat parts are manually moved to a position away from that which they will move to under the influence of gravity alone.

2. A reclinable seat according to claim 1 in which each hinge element is securable in its unlocked condition.

3. A reclinable seat according to claim 1 or claim 2 which incorporates a tubular metal frame.

4. A reclinable seat according to any preceding claim in which each hinge element is provided with a plunger which must be displaced bodily into the hinge against a spring force in order to place the hinge element in its unlocked condition.

5. A reclinable seat according to claim 4 in which the direction of bodily displacement required to unlock the hinge is inwardly towards a centre-line of the seat.

6. A reclinable seat according to any preceding claim

in which each hinge element comprises inner and outer, mutually-rotatable bodies, each having a set of projecting teeth, and a plunger itself having a set of teeth, the teeth of the plunger being engagable simultaneously with the teeth of the bodies such engagement inhibiting relative movement of the bodies.

7. A reclinable seat according to claim 6 in which the teeth of at least one of the bodies or the plunger is shaped to interact with the teeth of at least one other of the bodies or the plunger so as to resist disengagement of the teeth while the relative positions of the teeth are those adopted while the seat is unsupported by a user.

8. A hinge assembly comprising inner and outer, mutually-rotatable bodies, each having a set of projecting teeth, and a plunger itself having a set of teeth, the teeth of the plunger being simultaneously engagable with the teeth of the bodies such engagement inhibiting relative movement of the bodies, the teeth of at least one of the bodies or the plunger being shaped to interact with the teeth of at least one other of the bodies or the plunger so as to resist disengagement of the teeth while the relative positions of the bodies are at a limit of movement in a first direction and so as to permit disengagement of the teeth while the relative positions of the bodies are at a limit of movement in an opposite direction.

9. A reclinable seat substantially as herein described with reference to the accompanying drawings.

10. A hinge assembly substantially as herein described with reference to the accompanying drawings.

The Patent Office

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Application No:	GB 9618429.6	**Examiner:**	Martin Holt Riley
Claims searched:	1-10	**Date of search:**	6 June 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): E2F (FAG)

Int Cl (Ed.6): A47C; EO5D 11/10; F16C 11/10

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X,Y	GB 1561207	(MORK) - see whole document	X:1,2,3,5 Y:4,6
Y	US 5358352	(KLARHORST) - see whole document	4,6
X,Y	US 5169257	(SHUEN-YI LIOU) - see column 3, lines 16-28	X:1,2,3,5 Y:4,6
Y	US 4582445	(WARSHAWSKY) - see whole document	4,6

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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